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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
OWENS, DOUGLAS W

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 08/21/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/903,160	BASCERI ET AL.	
	Examiner	Art Unit	
	Douglas W Owens	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 June 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29 and 38-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29 and 38-41* is/are rejected.

7)☒ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

2. Claims 1, 4 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by US patent No. 6,319,542 to Summerfelt et al.

Regarding claims 1 and 9, Summerfelt et al. teaches a method for forming a capacitor, comprising:

providing a non-oxide electrode, such as TiN (42, see TABLE Col. 5 and 6);

depositing a high dielectric-constant oxide dielectric material (36) on the oxidized surface (Col. 4, lines 25-54 and TABLE) of the non-oxide electrode; and

depositing an upper electrode (38).

Regarding claim 4, Summerfelt et al. teaches a method of forming a capacitor, wherein the non-oxide electrode is TiN.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 2, 3, 5-8,10-29, and 38-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Summerfelt et al.

Summerfelt et al. teaches a method for forming a capacitor, comprising:

providing a non-oxide electrode, such as TiN (42, see TABLE Col. 5 and 6);

depositing a high dielectric-constant oxide dielectric material (34, 36) on the oxidized surface (Col. 4, lines 25-54 and TABLE) of the non-oxide electrode; and

depositing an upper electrode (38).

Summerfelt et al. further teaches a capacitor that is part of a DRAM cell. Summerfelt et al. does not teach providing a field effect transistor having a pair of source/drain regions, wherein one of the source/drain regions is connected to the capacitor electrode and the other source/drain region is connected to a bit line. It would have been obvious to one of ordinary skill in the art to select this configuration of a DRAM since it is conventional in the art.

Summerfelt et al. does not teach a method, wherein the high-dielectric oxide is Al_2O_3, Ta_2O_5 or $Ba_xSr_{(1-x)}TiO_3$. It would have been obvious to one of ordinary skill in the art to select any of these materials since they are know materials that are well-suited for the intended use (high-dielectric constant oxides, see TABLE). The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Summerfelt et al. does not teach oxidizing the non-oxide electrode in an atmosphere containing O_2, O_3, H_2O or N_2O. The deposition of the doped BST ($BaSrTiO_3$) would have caused some oxidation of the TiN electrode since it must be performed under oxidizing conditions in an atmosphere containing oxygen. It would have been a matter of obvious design choice to select O_2, O_3, H_2O or N_2O, since each of these atmospheres contain the oxygen required for formation of the BST layer.

Summerfelt et al. does not teach oxidizing the upper surface of the non-oxide electrode at a temperature in the range of 250° to 700° or 250° to 500° C. It would have been within ordinary skill in the art to arrive at the optimal temperature for forming the BST layer, (which causes some oxidation of the TiN) through routine experimentation. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235

(CCPA 1955)

Summerfelt et al. does not explicitly teach a method, wherein the oxidation of the upper surface is performed in an oxide dielectric deposition chamber prior to deposition of the high-dielectric constant oxide material. It would have been obvious to one of ordinary skill in the art to not move the wafer to another chamber for deposition of the high-dielectric constant oxide material, since it is desirable to minimize handling of the wafer during production. Additionally, moving the wafer may have resulted in additional and undesired oxide growth.

Response to Arguments

5. Applicant's arguments filed June 13, 2002 have been fully considered but they are not persuasive.

The applicant argues that Summerfelt et al. does not teach oxidizing an upper surface of the TiN layer. Summerfelt et al. teaches oxidizing an upper surface of the TiN layer in Col. 4, lines 50-67, where Summerfelt et al. discusses minimizing oxidation of the TiN layer to prevent TiO_2 from forming since it is insulative. It is clear that Summerfelt et al. does not completely arrest the oxidation of the TiN layer, but merely minimizes it.

The applicant argues that Summerfelt et al. does not teach forming a high dielectric constant oxide on the oxidized surface of the non-oxide electrode. Summerfelt et al. teaches depositing a high dielectric-constant oxide dielectric material (36) on the oxidized surface (Col. 4, lines 25-54 and TABLE) of the non-oxide electrode (42, (See Fig. 9)). There is nothing in the claims requiring the high-dielectric constant dielectric to be deposited so that it is in direct contact with the oxidized surface of the non-oxide electrode. The claim only requires that the high-dielectric constant dielectric be deposited on the oxidized surface of the non-oxide electrode. Summerfelt et al. teaches this limitation.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

US patent No. 6,362,501 to Kim illustrates a conventional DRAM structure in Fig. 1C, wherein on source/drain region is connected to the capacitor electrode and the other source/drain region is connected to a bit line.

US patent No. 4,984,038 to Sunami et al. teaches the well known high dielectric constant oxides claimed in the instant application (Col. 12, lines 61-65)

US patent No. 6,239,461 to Lee teaches the well known high dielectric constant oxides claimed in the instant application (Col. 5, lines 9-14).

US patent No. 6,344,662 to Dimitrakopoulos et al. teaches the well known high dielectric constant oxides claimed in the instant application (Col. 5, lines 29-35).

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 703-308-6167. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for

the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

DWO
August 16, 2002

TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800